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## PROJECT 1 ABSTRACT

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Within the past decade, severe scab epiphytotics have been incited by *Fusarium graminearum* on wheat, (*Triticum aestivum* L.) durum, and barley (*Hordeum vulgare* L.) in most regions of the United States where growing conditions remain warm and humid during the flowering and grain fill periods. Yearly economic losses to growers caused by these epiphytotics have approached or surpassed \$500 million on several occasions since 1993. Efforts within the spring wheat breeding program at South Dakota State University to help alleviate local and regional scab losses have proven worthwhile. Several advanced breeding lines and varieties have been created that have elevated scab resistance levels and yield potential. These materials have been developed as the result of a scab germplasm screening program that has allowed for selection of the most resistant material. One field and two greenhouse screening cycles are carried out each year within our program. Approximately 100 F<sub>2</sub> populations are screened for scab resistance in each fall greenhouse cycle. Lines are derived from within populations and screened further in the spring greenhouse and summer field screening cycles. Approximately 9,000 hills can be tested in our greenhouse each year. A larger number of plots can be accommodated in our mist-irrigated field nursery. 'Briggs' and SD3546 are recently developed spring wheats that possess excellent yield potential and scab resistance. A concerted effort has been made by the small grains pathology group at South Dakota State University to identify unique sources of resistance to scab. A new goal within our spring wheat breeding project is to simultaneously introgress several of these resistant germplasm sources into an agronomically acceptable background. A complex population will be formed as a means of achieving this goal and recurrent selection will be carried out to identify lines with increased scab resistance and desirable agronomic characteristics. Although this will be a long-term research project, the diverse parental backgrounds that will be used to form our population lead us to believe that much progress will be attained in increasing scab resistance levels through the formation of this population.